

Hydrogen Recovery by ECR Plasma Pyrolysis of Methane, Phase I

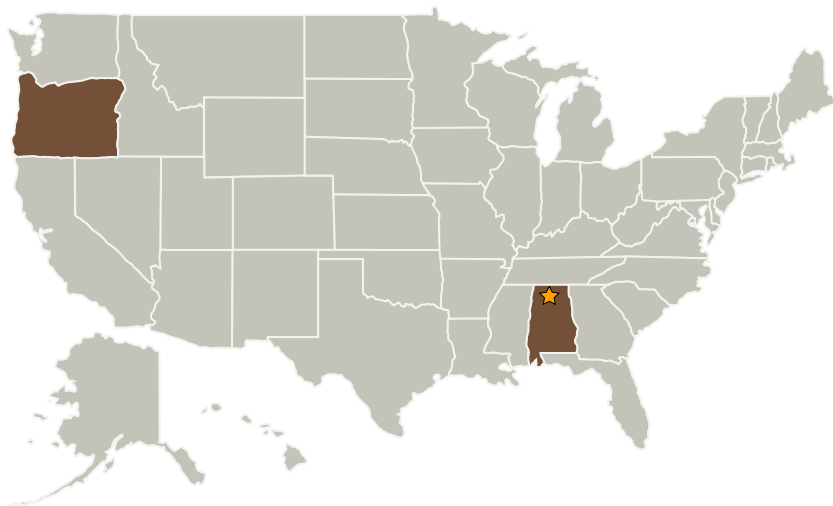
Completed Technology Project (2006 - 2006)



Project Introduction

Development of a microgravity and hypogravity compatible Electron Cyclotron Resonance (ECR) Plasma Methane Pyrolysis Reactor is proposed to recover hydrogen which is lost as methane in the conversion of carbon dioxide to water via the Sabatier process. This will close the hydrogen loop which currently requires 50% resupply. This technology will also produce elemental carbon as a secondary product, which may be employed as an adsorbent or catalyst carrier for removal of atmospheric trace contaminants, thus further lowering the resupply burden for manned spacecraft. ECR plasmas produce extremely high temperatures confined within relatively small spatial dimensions and can be generated under low power (10-150 W) conditions. The plasma is heated by the resonant absorption of electromagnetic energy, a much more efficient way to achieve plasma conditions, compared to traditional methods. The ECR method of plasma generation confines the plasma using magnetic force, and therefore, can be employed in microgravity, hypogravity, and Earth gravity. The primary problem associated with conventional fixed bed catalytic methane pyrolysis reactors is severe catalyst fouling and bed plugging due to the deposition of the carbon product. The proposed ECR Plasma based process will circumvent these problems.

Primary U.S. Work Locations and Key Partners



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Organizational
Responsibility**Responsible Mission
Directorate:**

Space Technology Mission
Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center
(MSFC)

Responsible Program:

Small Business Innovation
Research/Small Business Tech
Transfer

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Organizations Performing Work	Role	Type	Location
★ Marshall Space Flight Center (MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
UMPQUA Research Company	Supporting Organization	Industry	Myrtle Creek, Oregon

Primary U.S. Work Locations	
Alabama	Oregon

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
 - └ TX06.1.1 Atmosphere Revitalization